Consider three vectors $\mathbf{A}$ and $\mathbf{B}$ and $\mathbf{C}$ as shown. You are given the following:

- The length of vector $\mathbf{A}$ is 5 units and the angle between vector $\mathbf{A}$ and the $x$-axis is $\theta = 53.1^\circ$. (Note — no calculator needed: $\cos \theta = 0.6$ and $\sin \theta = 0.8$.)
- The length of vector $\mathbf{B}$ is 2 units and it points along the $x$-axis.
- The $x$- and $y$- components of vector $\mathbf{C}$ are shown in the figure.

Calculate the following three vectors, and find which one is longest:

1. $\mathbf{A} + \mathbf{B} + \mathbf{C}$
2. $\mathbf{A} - \mathbf{B} + \mathbf{C}$
3. $\mathbf{A} + \mathbf{B} - \mathbf{C}$

The velocity of a particle moving in 2 dimensions is given by

$$\mathbf{v}(t) = (A + B t) \hat{i} + C t^2 \hat{j}.$$ 

The position of the particle at time $t = 0$ is $\mathbf{r}(0) = x_0 \hat{i} + y_0 \hat{j}$.

Calculate $\mathbf{x}(t)$ and $\mathbf{a}(t)$.